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Review

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Factors Affecting the Land Investment Decisions in the Old Members of the European Union: A Systematic Literature Review

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Abstract: In response to concerns over land concentration and access within the European Union, this study seeks to elucidate the factors influencing farmers' decisions to invest in land and the consequent growth of farm size. Employing a systematic literature review utilizing the PRISMA method, we delve into theoretical and empirical studies to bridge the gap between agricultural management practices and land market dynamics. Our analysis reveals a complex interplay of endogenous and exogenous factors, including technological advancements, farm characteristics, demographic factors, macroeconomic conditions, and policy environment, significantly impacting investment behaviours and farm growth trajectories. The research highlights the underexplored impact of external factors like policy and land regulation, which are scarcely addressed in empirical studies despite their substantial influence on farm-size evolution and investment decisions. Furthermore, the study emphasizes the need for future research to incorporate a more comprehensive framework that integrates internal farm dynamics with broader economic and policy contexts, thereby facilitating a deeper understanding of the agricultural sector's resilience and sustainability. The findings underscore the critical role of adopting innovative methodologies and approaches to fully understand the dynamics of farm growth and land investments, aiming to support policymakers, stakeholders, and researchers in fostering sustainable agricultural practices.

Keywords: farm-size growth; agricultural land investment; farm investment decisions; farmland market

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1. Introduction and Objective

Land is a durable, immobile, heterogeneous, and non-reproducible asset and is one of the main factors of farm production. It is a fixed resource, at least in the short term, sometimes scarce. In the agricultural sector, more than in other sectors, land represents one of the most important limiting factors to ensure the farm development and efficient expansion of the farm [1–3]. These intrinsic characteristics contribute to considering land differently from the other factors of production on a farm and to making the land market thin and local [2,4]. In 2017, the European Parliament expressed concern about the concentration of land in the hands of a few large farms and called on Member States to review the policies and regulations governing the national land market to prevent land concentration, facilitate and ensure access to this fixed productive factor and sometimes scarce input. The European Parliament reiterated how important it was to ensure that policies and land regulations support the entry of young farmers and the survival of small and family farms that have fewer financial means than large farms. Small family farms play a central role in preventing rural depopulation and maintaining the socio-economic infrastructure in rural areas [5].

The purchase represents a form of investment through which farmers can access the land factor and increase the size of their farms. Investment in land occurs less frequently than in other types of investment (e.g., machinery or buildings), and it does not necessarily happen at the same time it was planned. The supply of the local land market hardly meets the farmers' demands for land when they are planning the investment [6,7]. On the one hand, purchasing land, unlike other forms of increasing farm size, guarantees the full transfer of ownership rights, allowing the owner to use it as a collateral asset. On the other hand, purchasing land may require a significant financial commitment and thus limits the investment in other productive assets [8–10]. Research on land investment and the land market has been hampered by the lack of a well-structured database, especially in Europe, mainly because this type of investment occurs less frequently than others. Therefore, it is necessary to observe the farm for an extended period in order for the land purchase to occur [6,11]. There are no literature reviews on factors influencing the decision to invest in land, and no ex-post empirical studies exclusively focus on this type of long-term investment.

To fill this gap in the literature, this study aims to identify the factors that directly or indirectly influence farmers' decisions to expand farm size through long-term investments in Old Member States of the EU. Resuming the distinction adopted in previous research (e.g., [8,12]), Old Member States are Western countries of the European Union that, unlike the so-called New Member States, did not undergo a period of transition from the Communist regime that led to an important and significant change in land governance and the creation of land institutions. In general, the so-called New European Countries underwent a transition from a centrally planned economy to a market-oriented one, and in addition, farms in the New Member States did not yet have access to the aid and subsidies provided by the Common Agricultural Policy. Therefore, the decision to focus on the so-called Old Member States was linked to the fact that no historical and political events in these countries were expected to lead to major changes in the land market, farm structure, and farm-size growth.

In this literature review, a different approach has been taken to consider land investment as the result of a reasoned process by the farmer considering internal farm characteristics and external factors. Therefore, the aim was to put the farmer at the centre and to understand which factors identified in the literature might influence the long-term investment decision in this fixed productive factor. Since the focus is not on the land market per se but on the farmer as an entrepreneur, an attempt was made to identify those elements that might be related to and directly or indirectly influence land purchase. Considering the gap in the literature on land investment and that the purchase represents both a form of farm-size growth and a form of investment that takes place within the agricultural land market, to achieve the objective, it was deemed appropriate to integrate three strands of literature: farm-size growth and structural change, investment decision, and agricultural land market.

To achieve this goal, a systematic review of the literature using the PRISMA method was carried out. The step-by-step approach that is this method was deemed to be the most appropriate for managing, integrating, and selecting studies from different strands of the literature in a reasoned way.

Understanding this systemic literature review requires some context. Farm-size growth is a key indicator for structural change in agriculture [11], so this review aims to identify factors influencing land investment decisions. We first examine theoretical literature on structural change, integrating it with research on investment decisions and the agricultural land market. Subsequently, we will analyse empirical ex-post studies based on micro-data to understand the models used for studying farm-size growth and investment decisions.

The remainder of the paper is organised as follows: Section 2 describes the methodology adopted to conduct the systematic literature review. In Sections 3 and 4, the results of the analysis of the theoretical and empirical studies are reported, respectively. Section 5 is dedicated to discussing the results; finally, Section 6 draws conclusions and prospects for future research.

2. Methodology

The systematic literature review was conducted by adopting the PRISMA method. Specifically, the PRISMA flowchart proposed by Moher et al. (2010) [13] was applied following the guidance of Koutsos et al. (2019) [14], who evaluated and promoted the adoption of this method in the field of agricultural research.

A relevant advantage of the PRISMA method is that it allows a focus on precise objectives and reduces the author's subjectivity [14].

2.1. Scoping

In order to identify the factors that may influence farmers' land investment decisions and the quantitative models that have been used to study investment decisions and farm-size growth, the following research questions have been set:

- RQ1. How do the farmer's socio-demographic characteristics, farm specialization, and initial farm size interact to influence farm growth and the decision to invest in land?
- RQ2. How do external factors, including policy, land regulation, and macroeconomic conditions, impact farm-size growth and investment decisions in the agricultural sector?
- RQ3. What methodological approaches and models are most prevalent in the literature for analysing farm growth, and how do these approaches address the interaction between endogenous and exogenous factors affecting farm-size expansion?

2.2. Planning

Considering that land purchase represents a long-term investment involving an increase in farm size and taking place within the land market, several keywords related to the three strands of literature were identified, and different Boolean operators were used. Through preliminary tests, the following keywords were identified: "farm size", "farm size growth", "structural change", "investment", "investment behaviour", "agricultural land price", "agricultural land market", "farmland market", and "buyer".

In the preliminary phase, the search was performed on both Scopus and Web of Science. However, it was found that the search in Scopus yielded a higher number of results, including all those in Web of Science. Therefore, it was considered appropriate to analyse the Scopus results.

2.3. Identification

For each literature stream, a search was conducted with different keyword combinations. No additional filters (such as subject area, document type, language, or year) were used. The search conducted in March 2024 identified:

- Search string: "farm size" and "farm growth" and "structural change". Output: 91 documents on Scopus from 1992–2024.
- Search string: "agricultural land price*" OR "agricultural land market*" OR "agricultural land value" OR "farmland market" OR "farmland price*" AND "buyer*". Output: 181 documents on Scopus from 1984–2024.
- Search string: "investment behaviour" AND "investment*" AND "farm" OR "agriculture". Output: 83 documents on Scopus from 1968–2024.

2.4. Screening

During this phase, duplicate files and those unrelated to the topic under review were eliminated based on reading the title and abstract. Thus, 198 articles were selected through this phase. In particular, we excluded all studies that did not explicitly refer to investment in land for agricultural use or farmland growth, as well as empirical studies conducted in developing countries.

2.5. Eligibility

Following the full-text reading of articles, it became clear that the socio-political context, the regulations, and the implemented agricultural policies play a role in the land market and structural change in the sector. For this reason, it was decided to include articles focusing on the effect of these elements on the increase in farm size and the land market. On the other hand, regarding the analysis of empirical papers, it was decided to focus on articles focusing on Old Members of the European Union. Therefore, this led to the exclusion of all studies that did not cover these countries.

In addition, it was considered appropriate to introduce 15 documents found within the literature of the analysed articles because they were considered important for achieving the review's objective.

At the end of this phase, we selected 48 documents, of which 24 were eliminated for the reasons discussed in this section.

2.6. Presentation

From the documents chosen in earlier phases, 24 were singled out and incorporated into the qualitative analysis discussed in subsequent chapters. Based on the analysis of the full-text articles, the decision was made to split the presentation of findings into two sections: a review of theoretical and empirical studies. In the first, the endogenous and exogenous factors identified by analysing theoretical papers on structural change in the agriculture sector and in the introduction of the empirical articles are presented. In the second, studies implemented models by analysing micro-data are reported.

In the Figure 1, we mapped out the identified papers included or excluded.

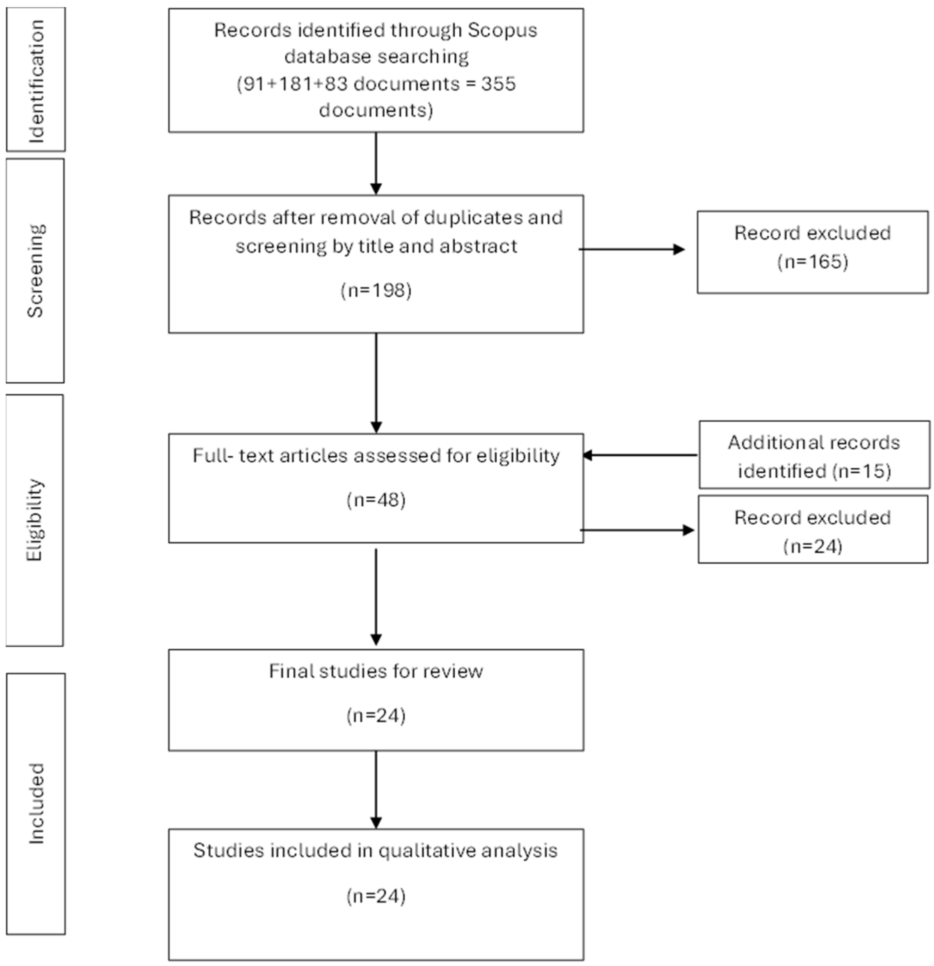

Figure 1. Prisma Flow Diagram.

3. Theoretical Studies Review

3.1. Internal Farm Characteristics

Researchers seem to agree that technology adoption, mechanisation, and specialisation have contributed to developing economies of size, scale, and farm-size growth [15–17]. Land, machinery, buildings, and (family) labour are indivisible factors of production [18] and are linked by a proportional relationship. Technological innovation needs a minimum farm size to be considered profitable and, in the past, has been necessary and functional to replace labour. According to Boehlje (1992) [16], the increase in non-agricultural labour costs contributed to the rise in the opportunity cost of agricultural labour, triggering technological development. Indeed, it was possible to substitute labour through physical capital and machines. In addition, technological innovation has allowed the farmer to produce on a large scale while maintaining a fixed labour input [16]. The more expensive and complex the innovation becomes, the more the farmer will be incentivised to produce a few output types. Specialization allows farmers to spread fixed costs over multiple hectares dedicated to producing a few selected outputs, where farmers allocate and concentrate their managerial skills and capital [19]. The early adopters of technologies in the agricultural sector will benefit from a competitive advantage in the initial phase.

Nevertheless, as innovation spreads and competition intensifies, the overall sector output will increase, leading to decreased prices. As a result, only those who have adopted the technology will have a higher likelihood of remaining within the sector [17]. Although small and large farms may adopt innovative technologies equally, farm growth induced by technological progress seems stronger for large farms because they are more likely to have access to information, funding, and managerial capacity [20,21]. This, in turn, puts pressure on small farms, which may either exit the sector or reduce their size [18]. Benefiting from economies of scale and technology adoption, large farms may have strong ambitions to grow by inhibiting the growth and survival of small farms. Large farms are therefore considered in the literature as potential 'predators', while small farms are viewed as 'prey'. Predator–prey relationships in the land market are attracting researchers' interest, especially in regions with solid differences in farm structures [22]. In this sense, receiving off-farm income could help small farms survive and remain within the sector. This income could be used to subsidise farming activities, at least in the short term, or represent a valuable form of supplementary income to manage price fluctuations and stabilise the total household income of the small farm [17,20,21]. While off-farm income could help small farms survive, better off-farm remuneration could be the first step in the small farm's exit from the agricultural sector [17]. Therefore, it is still unclear how off-farm income can influence farms' survival and investment decisions.

Human capital is considered one of the main factors that can influence farm growth. This factor refers to the farmer's age, level of education, public education programs, know-how, years of experience, and managerial skills [15–17,20]. Information management, technology assessment, and adoption, as well as the allocation of farm resources, are influenced by managerial skills and investment in human capital. Human capital also includes consultancy and advisory services that the farmer can purchase externally [16]. According to the researchers, the improvement of human capital within the agricultural sector corresponds to better and more efficient farm management, which is why this factor is considered one of the main drivers of the expansion of farms over time. Managerial skills also appear essential in introducing and using new technologies, especially when these are difficult to use and expensive. It is very likely that farmers who are unable to use such technologies cost-effectively will leave the sector and favour a few large farms again [16,20,23].

The farmer's age is one of the main socio-demographic factors analysed in studies of farm-size growth and investment decisions. When a young farmer runs the farm, it is expected to grow and increase in size faster than farms run by older farmers [19,24]. As the farmer's age increases, the farm will be in the so-called maturity and decline stages. The farmer is expected to be more reluctant to conduct investment forms, especially in the medium to long term [19]. In these two phases of the farm life cycle, the presence of a potential successor could positively influence the expansion of the farm and prevent it from entering the decline phase [25]. The decision to invest in structural assets such as land may require a robust and durable financial commitment on the part of the farm. The presence of a young farmer and a successor increases the time horizon of the investment and could be less risk-averse, positively influencing the investment decision and the growth of the farm [6,25–27].

The presence of young farmers within the sector means having farmers who are better trained in the use of new technologies and who are also supported by investment and modernisation programs that inevitably lead to an increase in mechanisation and capitalisation of the sector [15]. Goddard et al. (1993) [20] hypothesised that the reduction in the number of young farmers would contribute to the decrease in individual farms and the increase in non-traditional forms of management, farm corporations, and vertically integrated food processing [20,24]. Eurostat data shows 94.8% of European farms were family farms in 2020, with France and Estonia being exceptions [28]. The explanation for this can be found in the sociological model described by Boehlje (1992), who identified a social and an individual reason why the agricultural sector continues to be based on family farms. On the one hand, the maintenance of family farms would guarantee society's efficient production, food supply, and community viability. On the individual side, it would guarantee an independent lifestyle and the possibility of controlling one's future. In the case of multi-generational farms, it provides an opportunity for the next generation. Especially in the phase of transferring ownership, the young person setting up on the farm can benefit from the help and experience of the outgoing farmer [16].

3.2. Exogenous Factors

In addition to factors related to the farm's structural and socio-demographic characteristics, exogenous factors associated with the economic and policy environment can influence investment decisions and farm growth [17].

Macroeconomic factors such as the interest and inflation rates seem to influence investments, particularly those in structural assets. As the cost of capital increases, the likelihood of the farmer conducting a form of investment decreases. Investment in land and buildings may require a substantial financial commitment, and the farm may need a loan from the bank [6]. Besides the overall economic situation, the farm's financial reputation may be significant during negotiation with the bank [6]. The inflation rate affects the economic development of the agricultural sector and the supply and demand for land [29,30]. The value of land increases more than the inflation rate, which makes land a "safe haven" asset, i.e., an asset to protect the value of capital from the inflation rate [2,8]. These characteristics make the land a financial asset and store of wealth that also attracts investors from outside the agricultural sector [31], as was the case during the 2008 financial crisis when major investors invested in the land since they considered farmland a safe investment [5,32]. In this sense, policymakers, via land regulation, another exogenous factor, could strengthen and protect the position of farmers. The main objectives upon which the different Member States regulate the agricultural land sales and rental markets are to retain land for agricultural use, support the rural population, reduce land fragmentation management, and reduce land concentration [31]. Each Member State of the European Union has full jurisdiction and decision-making power to regulate the agricultural land market, and this varies considerably between the different European countries [31,33]. The European Union has not issued any secondary regulations that could influence land market transactions [31] (European Commission. Joint Research Centre. 2021a). Still, recently, at the urging of the European Economic and Social Committee, the European Parliament called on all Member States to review their land regulations so that they could avoid a concentration of land in the hands of a few large farms and ensure fair access to land [5,34]. History and politics have influenced different countries' regulations [35]. France is an exception among the Old Member States because it has stringent regulations affecting both the purchase and rental markets [31,35]. According to the existing literature, stringent land regulation characterised by price and rent control avoids the capitalisation of subsidies under agricultural policies in the value of the land, at least in the short term [35]. Several theoretical and empirical studies have been carried out to estimate the impact of subsidies on land prices and land rents. From a theoretical point of view, if the land market were perfect, decoupled direct payments (DDPs), coupled direct payments (CDPs), and rural development programme (RDP) and environment payments could be capitalised within the land price.

The capitalisation rate is higher for DDP subsidies, ranging from 0 to full capitalisation, depending on the type of subsidy [36]. The availability of data, especially in Europe, has allowed empirical research to be conducted mainly on rents rather than land value [36]. In general, what has emerged is that the capitalisation rate within the land price is lower than theoretically assumed and varies significantly across studies. Based on the FADN 1989–2016 data, it was estimated that only DDPs influence the value of land. In the short run, the capitalisation rate varies from 28.8% to 32.1%, and in the long run from 154% to 164%. However, these estimates must be taken with caution due to problems with the accuracy of the data and econometric issues [36]. The capitalisation of CAP subsidies within the land price is also conditioned by other factors such as farm credit constraints, elasticity of land supply, and social capital [36]. Agricultural policy affects not only the price of land but also the decision to invest. Subsidies were introduced with the main objective of supporting farmers' incomes in the event of price fluctuations due to changes in demand and/or in output prices. According to economic theory, any incentive introduced as a subsidy to the farmer increases the marginal return by increasing the price of outputs, either by reducing the cost of production or by increasing the return on subsidised farming activities [36]. As subsidies represent a secure form of income not subject to production risks, it is reasonable to assume that they can positively influence the investment decision, especially in relation to imperfect capital markets, bankruptcy risk and other financial problems [37,38].

4. Empirical Study Review

4.1. Farm-Size Growth

In the literature on agricultural structural change, researchers use various models to study farm behaviour, including econometric models based on regressions on a number of explanatory variables [17]. Several studies have been implemented to study farm growth or size, and these studies have often been developed from Gibrat's law [17,39]. This law states that a firm's growth is independent of its size and is conditioned by random factors. The basic equation of Gibrat's law is as follows:

$$lnS_{\mathrm{i(t)}} - lnS_{\mathrm{i(t-1)}} = \alpha + \beta lnS_{\mathrm{i(t-1)}} + u_{\mathrm{i(t)}} \quad (1)$$

where $lnS_{\mathrm{i(t)}}$ is the firm size at time t, and $u_{\mathrm{i(t)}}$ is the random effect [17].

According to the social science researchers, within these random factors there were systematic factors of primary importance that needed to be included and made explicit in the basic fundamental equation of the law [17].

Four ex-post research studies based on micro-data analysis were identified in the literature. In these studies, the authors introduced the factors they believed could influence farm growth. Weiss (1999) [21] uses Gibrat's law as a starting point to develop his econometric model, highlighting the importance that individual and farm-specific characteristics can have on farm survival and growth. To explain these two aspects of structural change, the author analyses panel data consisting of more than 50,000 farms in Upper Austria observed in three years: 1980, 1985, and 1990. Weiss (1999) [21] adopts the Heckman model, which suggests a two-step procedure. In the first step, the probability that the farm will survive is estimated through probit regression models. In the second step, these estimates constitute additional explanatory variables for the growth of the farm. The author develops four models: in the first, he assumes that farm growth is monotonic; in the second, he assumes a non-monotonic relationship between initial farm size and farm growth; in the third and fourth models, he analyses the data by separating full-time and part-time farms. To measure the size of the farm, the author uses the number of livestock (measured in "median large animal units"). Analysing the data by separating full-time and part-time farms leads the author to reject Gibrat's law.

The research showed that small farms grow faster towards a minimum efficient production scale than medium-sized and large farms. When the analysis looked only at full-time farms, the author identified only one pole of growth and growth polarisation. When the data were analysed in aggregate or when only part-time farms were considered, the author identified two centres of attraction and growth polarisation. This led to the assertion that medium-sized farms in Upper Austria would disappear and that off-farm work could influence the structural change in the agricultural sector. Through the implemented model, Weiss (1999) [21] identifies socio-demographic characteristics of the farmer and his family that may influence the farm's survival and/or growth. In particular, the presence of young farmers influences farm survival and growth. Farm survival is affected when the farmer is over 51 years old. The presence of the successor has a positive effect on full-time farm growth, while it does not affect aggregate data for part-time farms. Agricultural-specific schooling positively affects the probability of survival and farm growth of full-time firms, while it does not affect part-time firms. The level of general schooling has the opposite impact on the survival of full-time (+) and part-time (−) farms, while it does not affect farm growth in either case. The marital status of the operator, and when the operator is married, has a significant effect on survival and growth when aggregate data and full-time farms are considered. The number of family members also influences the growth and survival of the business. In particular, family members between the ages of 6 and 15 increase the probability of business survival. Family members represent a labour force resource and stimulate expansion [21,40]. The effect and relationship between family size and structural and farm growth affect full-time farms more than part-time. The variable related to non-farm labour, considered only in the aggregate data analysis, negatively influences farm survival and growth probability. The data available determined the choice of explanatory variables. The researcher would have liked to introduce socio-demographic factors or variables on farm debt, but the lack of data did not allow him to do so.

Akimowicz et al. (2013) [15] combine three complementary econometric models to analyse whether and how farm, farmer, and territorial factors can influence farm size in terms of utilised farmland and farm-size growth. The research was conducted on 5000 professional farms in the Midi-Pyrénées region observed in 2000 and 2007 regarding farm size and type. The authors adopt three regression models. A first model was developed to study the effect of explanatory variables on farm size. It is represented by ordinary least squares (OLS), in which the dependent variable is numerical and defined by the logarithm of the farm size (expressed in UAA) observed in 2000. The second model consists of a multinomial logit developed to emphasise the effect on the dynamic of enlargement or reduction in size. Thus, the dependent variable is the change (enlargement or reduction) in farm size above the 2% threshold between 2000 and 2007. The third model is the Tobit model, whose dependent variable is the logarithm of the growth intensity between 2000 and 2007.

The results of the research showed that small farms grow faster. The type of farm is the most important farm characteristic influencing farm size, and the level of specialisation affects and influences the change in size. Cash-crop farms are significantly larger than the others. In contrast, mixed crop–livestock and livestock farms have grown more during this period, probably due to the decline of livestock farming on a regional scale. The age of the farmer and the presence of a successor are the main socio-demographic factors that have most influenced farm-size growth. Furthermore, most small farms that grew between 2000 and 2007 were run by young farmers. Due to a lack of available data, the authors cannot state whether and how much the SAFER policies stimulated this. Off-farm activities and human capital do not influence farm growth. What does emerge is that farmers with agricultural training run larger farms. Considering spatial factors, farms in the urban area or rural areas tend to be smaller than those in deeply rural areas. It is not clear how proximity to urban area might influence size dynamics. According to the authors, specific local policies and regulations for conserving agricultural land may exist. These urban policies and regulations may vary from department to department and have different effects on the dynamics of farm-size increase or decrease and the intensity of farm growth.

Bremmer and Oude Lansink (2002) [19] analyse the effects of farm structure, performance, and farmer characteristics on farm renewal and growth. The analysis was conducted on Dutch-FADN data combined with survey data. The research focuses on data from farms specialised in horticulture and arable crops. The researchers developed two probit models with different dependent variables. In one model, the dependent variable assumed a value equal to one when the farm and productive areas increased by at least 5%. In the second model, the dependent variable assumed a value equal to one when the farm innovated or diversified. The authors adopt both models to analyse the data both in aggregate and by analysing them for individual specialisations, i.e., arable crops and protected-horticulture farms.

Aggregate data analysis showed that the structural characteristics of the farm have a much stronger effect on farm development than variables related to the socio-demographic characteristics of the farmer and farm performance. In particular, the degree of mechanisation affects both farm growth and farm renewal. Farms specialised in field crops grow more than farms specialised in protected crops (mushrooms and cultivation under glass). Initial farm size does not affect the probability of the dependent variables in either model developed. Therefore, Bremmer and Oude Lansink (2002) [19] confirm Gibrat's law. Family labour input and solvency negatively affect farm growth and renewal probability when data are analysed in aggregate. These two variables lose their effect when individual specialisations are analysed. Contrary to the hypothesis and unlike the other studies identified, age, the presence of a successor, and off-farm income do not influence farm development.

Analysing the data by individual specialisation showed that the initial size influences growth positively in the case of arable crops and negatively in protected horticulture. The level of mechanisation only positively influences farm renewal in the case of arable crops. Age affects the probability that the farm grows in the case of protected-horticulture farms. Profitability at $t - 1$ negatively influences the probability of growth in the case of protected crops, whereas profitability at $t - 2$ has a positive influence.

Brenes-Muñoz, Lakner, and Brümmer (2016) [41] attempt to identify factors that may affect farm growth in the case of organic farms as researchers had only focused on the study of farm-size growth in conventional agriculture. To cover this gap in the literature, the authors develop a model to investigate farm growth in terms of UAA and agricultural revenue by analysing an unbalanced panel dataset consisting of 2759 observations from 453 organic farms in Bavaria and Baden-Württemberg observed/registered between 1993 and 2005. The model adopted is a regression analysis where the dependent variable is the first logarithm difference of the farm size, as UAA and agricultural revenue and the explanatory variables are related to structural and socio-demographic characteristics of the farm. The results showed that farm size in terms of output is negatively influenced by the previous year's agricultural revenue and positively influenced by the previous farm size. The variable "capital", i.e., annual depreciation and "labour" (annual work unit) introduced in the model influence the dependent variable in terms of agricultural revenue but not in terms of UAA. Part-time farming and the age of the farmer do not influence farm growth in terms of either area or revenue. However, it should be noted that the average age of the sample is 43, i.e., young farmers on average. Subsidies received for organic production influence farm growth in terms of UAA but not in terms of agricultural revenue. According to the authors, subsidies help to mitigate the effect of low and irregular yields and support the farm during the transition from conventional to organic. Livestock units influence farm growth both in terms of agricultural land and output. Specialisation in arable crops influences growth in terms of UAA, while specialisation in pig and poultry farms influences farm growth in terms of output. Soil quality has a positive influence on agricultural revenue but not on farm area growth. The authors conclude that large farms scale up more frequently than small farms. The greater capital at their disposal allows large farms to scale up faster than small farms and to cover any conversion costs.

4.2. Investment Decision

In the literature on the investment decision, only two articles have been identified that carry out ex-post analyses on micro-data, and that include land investment: Elhorst (1993) [6] and Oskam, et al. (2009) [26]. Both studies were conducted in the Netherlands based on the Dutch Farm Accountancy Data Network provided by the LEI Wageningen Ur and focus on one agricultural specialisation, dairy sector, and horticultural production, respectively. In both studies, the authors analyse farmers' investments in at least one of the three farm assets: land, machinery, and buildings. Albeit in different ways, the authors consider both the investment decision (also defined as the "participation decision") and the level of investment. The investment decision represents a discrete problem [6] and can be described by logit or probit models. The investment level represents a continuous problem and can be modelled by a linear regression model.

Elhorst (1993) [6] analyses unbalanced panel data from which he reconstructs a balanced panel data of 4204 observations collected between 1978/79 and 1988/89 concerning the Dutch dairy sector. The author develops the final investment equation from neoclassical production theory, in which he integrates elements of financial investment theory. In particular, he bases his statistical model on the infrequency of purchase model developed by Blundell and Meghir (1987) [42] by altering it using the logit regression model instead of the probit regression model. In particular, the explanatory variables of the binary variable consist of three variables describing the financial position of the firm: one variable describing the short-run profit one year delayed, another describing the percentage of the farm owned, determined from the initial capital stock held as a proportion of the total initial capital stock, and another variable related to the nominal interest rate on mortgages deduced from the statistics of CBS (%). The explanatory variables for the level of investment consider the structural characteristics of the farm, socio-demographic characteristics, and external factors related to the price of inputs and outputs. Therefore, through the model developed, the author assumes that a farmer who is not in a good financial position will not consider investing. Despite this, the author states that it would still be reasonable to assume that the explanatory variables used to explain the level of investment could also influence the investment decision. For this reason, Elhorst (1993) [6] considers it appropriate to discuss the results based on the latter option.

The results show that the farmer's financial position affects the distinction between zero and non-zero observations when investing in land. As the age of the farmer increases, the investment decreases. The presence of the successor tends to increase the farmer's willingness to invest, probably because the horizon time of the investment increases. Thus, the presence of a successor thus induces a slight increase in investment. Increases in output and input prices have opposite effects on investment. The former is positive, the latter negative.

Furthermore, the increase in the price of outputs has a more significant effect on investment than the reduction in the cost of inputs. The increase in the price of capital holds back investment. Investment in land decreases by 0.14% when the price of capital increases by 1%. Family labour has a positive effect on investment.

Oskam, Goncharova, and Verstegen (2009) [26] analyse unbalanced panel data consisting of 5341 observations on 1390 Dutch glasshouse horticulture firms observed between 1975 and 1999. The authors start from the assumption that the farmer tends to maximise his profit and that those who invest must also consider the adjustment costs. To define the model, the authors start from Bellman's (1957) equation, according to which the price of inputs, outputs, and capital determines profit. Variables associated with having a successor and significant debt appear to impact the likelihood of investing more than the level of investment. Nevertheless, the authors adopt the same explanatory variables in the two regression analyses constituting the Heckman Selection Model. Unlike Elhorst (1993) [6], the authors do not combine the two decisions within a single model but treat investment participation and investment level separately. Furthermore, they do not analyse the data by types of investments but analyse the data in an aggregate manner. The research showed that the probability of making an investment (participation to invest) is positively influenced by increasing output price, household welfare, revenue, farm price growth, and energy price. As farm capital increases, both the probability of investment and the level of investment decrease. As the farm's debt increases, the likelihood of investment decreases, but the level of investment increases. The initial farm size only positively influences the level of investment. An increase in the cost of capital leads to a decrease in the probability of investment but an increase in the level of investment. Finally, the farmer's age negatively influences both the level and the investment decision.

Both studies report that investing in land is the least likely to occur compared to investing in buildings and machinery. Elhorst (1993) [6] analysed the observations of farms that did not invest: 82% concerned land, 47% buildings, and only 20% machinery. In the Oskam, et al. (2009) [26] study, 91% of the zero observations concerned investments in land, 35.7% in buildings, 16.2% in installations, and 20.4% in machinery. By extending the observation time, the probability that the farmer invests increases. According to Elhorst (1993) [6], the likelihood of investing in land increases by 15% if the observation time is increased by one year to about 50% more if it is increased by five years. According to the researchers, the low frequency of land investments is due to aspects related to the location of the land and the availability of land on the market. It is not certain that the farmer will find the amount of investment he needs in the market. Consequently, the time of planning and realising the investment may not coincide [6].

Table 1 shows the relevant models and independent variables for each empirical article analysed.

Table 1. Empirical papers analysed.

Paper	Models Implemented	Variables Considered
Farm growth and structural change		
Weiss (1999) [21]	Heckman model characterised by a two-step approach. (1) Probit model to estimate the probability that the farms survive; (2) Four models: monotonic farm growth; non-monotonic farm growth, full-time farms, part-time farms	Farm structural characteristics: initial farm size Socio-demographic characteristics: age, presence of successor; agricultural-specific education, level of "general" education; number of family members, farmer's marital status, off-farm (part-time farming), gender
Akimowicz et al. (2013) [15]	Three different models: - OLS, where dependent variable is logarithm of farm size; - Multinomial logit model, where dependent variable is increase/decrease in UAA; - Tobit model, where dependent variable is logarithm of growth intensity.	Farm characteristics: farm size, farm type; level of specialization; legal status Socio-demographic characteristic: age, presence of successor, off-farm and human capital, gender of the farmer, off-farm job, level of agricultural education, level of general education Local characteristic: department, type of area (urban, per-urban, rural, deep rural)
Bremmer et al. (2002) [19]	Two probit models with dependent variable assumes value equal to 1 - farm innovated or diversified - farm increased both farm area and productive area	Farm characteristics: initial farm size, degree of mechanization; specialization, solvency, profitability Socio-demographic characteristics: family labour input, age, presence of successor, education, off-farm income
Brenes-Muñoz et al. (2016) [41]	Two regression analyses in which the dependent variable is, respectively, the difference of the first logarithm of the UAA and agricultural revenue	Farm characteristics: initial farm size, agricultural revenues (t − 1), capital (as annual depreciation), labour (as annual work unit); specialisation (mixed farm, arable crops, pig and poultry farms), soil quality Socio-demographic characteristics: age, part-time farming Policy environment: subsidies for organic production

Table 1. *Cont.*

Paper	Models Implemented	Variables Considered
Investment decision		
Elhorst (1993) [6]	Statistical model based on infrequency of purchase model developed by Blundell and Meghir (1987) [42] by altering it using logit regression model instead of probit regression model	Financial variables: short-run profit one year delayed, % of farm owned, and nominal interest rate Socio-demographic characteristics: age, presence of successor, family labour input; Internal characteristics: value of buildings and machinery External factor: output and input prices
Oskam et al. (2009) [26]	Heckman selection model	Farm structural characteristics: firm size, financial and economic characteristics: capital, wealth, debts, labour cost, revenue Socio-demographic: characteristics: age, presence of successor, new entry External factor: output price, energy price, price of capital

5. Discussion

The literature review suggests that endogenous and exogenous factors influence farm-size growth and investment decisions. Theoretical evidence suggests that these factors do not operate in isolation. Instead, they interact dynamically to affect farm-size evolution and investment behaviour [16,17,20].

By combining the analysis of theoretical and empirical articles, it emerges that studies on the growth of farm size and land investment have been carried out in limited areas, are few in number, and are outdated. Empirical studies have often been conducted in geographically restricted and precisely defined areas. The study by Akimowicz et al. (2013) [15], although focused on a limited area, includes a categorical variable related to farm location as a department and a localized area (deep rural, rural-urban, and peri-urban). The geographical specificity of existing studies suggests that the interpretation of the land supply factors should be localised. Although there was no restriction on the year of publication in the "identification" and "screening" phases, only six empirical articles on farms in Old Member States were identified between 1993 and 2016. This could be due to two elements that have already emerged in the literature: the lack of a well-structured database and the low frequency with which land investments occur [6,11]. These two elements may have influenced both the observation period and the choice of independent variables included in the model. With the exception of Oskam et al. (2009) [26], the empirical studies analysed are based on panel data, in some cases reconstructed by the authors themselves (e.g., [6]) from unbalanced panel data with a minimum of 7 years and a maximum of 24 years of observations. The analysis of theoretical and empirical studies has also made it possible to identify those factors that are difficult to include in econometric models, both because of the data available and collected and because of the type of variable that can capture certain elements. Table 2 shows and summarises the categories of variables that have been identified in the literature and the type of influences they can exert.

Investment in land requires a long observation period, both because of the rigidity of supply in the land market and because the investment decision requires the farm to consider the financial commitment involved in relation to the availability of other complementary fixed factors, such as machinery and labour. These two factors, when taken into account, are independent variables that influence the growth of farm size, whether or not it takes the form of investment. The results of empirical studies could, therefore, confirm the theoretical assumption that mechanisation has an impact on the development and pursuit of economies of scale and size. It may be the prior investment in innovative machinery that drives the purchase and growth of farm size. Thus, investing in one type of company fixed assets can be complementary [43]. The effect of family labour is unclear from empirical research. The study by Bremmer et al. (2002) [19] shows that family labour has a negative effect on farm-size growth, while Elhorst (1993) [6] shows that this variable has a positive influence on the level of investment. As with family work units, empirical research does not clarify the role and effect of initial farm size. Research might suggest that there is a relationship between this, specialisation, and non-farm labour. With respect to the latter factor, in general, it seems that when introduced within the models, this does not seem to affect farm growth. In this regard, the model implemented by Weiss (1999) [21] provides insight into how this may affect farm growth and the growth rate of part-time farms.

Table 2. Categories of variables and type of influences.

Factor Category	Influencing Factors	Type of Influence
Technological advancements	Adoption, mechanization, specialization	Positive: enhances productivity, may favour large farms
Farm characteristics	Size, managerial capacity, specialization	Positive: larger size and better management lead to growth
Demographic factors	Age of the farmer, presence of a successor, family work units	Mixed: younger farmers/successors may lead to expansion; older farmers may not invest
Macroeconomic conditions	Interest rates, inflation rates	Mixed: higher interest rates deter; inflation can increase land value
Policy environment	Subsidies, land regulations	Mixed: subsidies can increase land value; regulations may restrict market
Farm size and growth	Small-farm dynamics, specialization	Positive: small farms grow faster; specialization drives size changes
Investment behaviour	Financial position, successor presence	Mixed: financial health critical; successor presence encourages investment

The type of specialisation seems to play a role in farm growth, but also in the approach taken by researchers to develop research. In studies of farm-size growth that do not focus on a single agricultural specialisation, an independent categorical variable related to this farm characteristic is always present in the model. It is interesting to note that the results of the study by Bremmer et al. (2002) [19] show how variables related to structural and socio-demographic characteristics can affect farm growth differently depending on specialisation, and how the effect of some variables can be lost when data are treated in aggregate form. Moreover, this result may be in support of what has been argued in the theoretical literature; namely, that the identified factors are not independent of each other. Although the models used do not make it possible to identify, analyse, and explain the relationship between the independent variables introduced in the models, they do at least allow us to understand the existence of a potential relationship between growth, specialisation, and structural and socio-demographic characteristics.

Furthermore, especially the field of structural change research, within the same study researchers have implemented regression models with the same independent variables in order to study and explore the phenomenon under investigation. In his research, Elhorst (1993) [6] does not exclude the possibility of using the variables to determine the level of investment and to study the investment decision. In general, the empirical results seem to confirm what has emerged from the theoretical literature on the relationship between farm growth, socio-demographic, and financial variables. Much attention seems to be paid to the influence of socio-demographic variables within the farm. The empirical results seem to confirm the findings of the theoretical literature regarding the relationship between the age of the farmer and the presence of a successor. In the absence of a successor, there is a non-linear relationship between age and farm growth and investment. Successor presence confirms the positive effect on farm growth.

Comparing the factors identified in the theoretical literature with those used in the empirical studies, it is evident that in the latter, variables related to policy and land regulation are scarce and almost completely absent. A variable related to organic farming subsidies is only present in the relative study of Brenes-Muñoz et al. (2016) [41], which focuses on this type of farming. The authors of the empirical research did not introduce independent variables related to land regulation. Only Akimowicz et al. (2013) [15] mention that the lack of data did not allow the introduction of variables related to this factor that could influence farm-size growth in France. This omission highlights a critical research gap, as policy, macroeconomic factors, as well as local and national land regulations undeniably shape investment decisions and farm growth trajectories.

Variables relating to external and internal financial factors are only introduced within the models designed and adopted to study the investment decision. The two empirical studies confirmed what had already emerged from the theoretical literature; namely, that the costs of capital, production and input prices influence the investment decision.

Regarding the method adopted by the researchers to conduct a quantitative analysis, it seems evident that the different types of regression models are the most frequently implemented. In the six research works analysed, the authors tended to adopt more than one model to analyse the data. This may be partly because the researchers had to develop the analysis of such a complex system without having sufficient literature on which to base themselves and with a limited type of data available. These two elements may also have influenced and conditioned the choice of the dependent variable that would best capture the farm-size growth. Regarding the two empirical studies concerning investment decisions, the high presence of zero observation may have affected the results. The same authors stated that this is one reason why conducting research on land acquisition using micro-data is also complex.

The method adopted by PRISMA and the criteria applied in selecting the papers did not allow for selecting and integrating literature that would allow for an in-depth and detailed analysis of certain factors' impact on farmers' behaviour and, indirectly, on the dynamics of the land market. For example, the research that has been carried out does not allow for a detailed explanation of the impact of technological innovation on the relationship between large and small farms.

Reflecting on the interplay between theoretical frameworks and empirical analysis highlights a significant opportunity for advancing research in farm-scale growth and land investment decisions. While the present review synthesizes findings from both theoretical and empirical perspectives, delineating a more straightforward pathway for applying theoretical constructs to empirical research emerges as a pivotal area for enhancement. Specifically, future research could benefit from a more explicit operationalization of theoretical models in empirical settings, assessing the feasibility and impact of integrating endogenous and exogenous factors within comprehensive econometric models. This approach would bolster the analytical rigor of studies in this domain and pave the way for a more nuanced understanding of the factors influencing farm-size evolution. Moreover, acknowledging and addressing the methodological challenges posed by the diverse and often fragmented nature of data within agricultural studies can further refine the empirical analysis. Future research can offer more detailed insights into the complex dynamics governing land investment decisions and farm growth by forging stronger linkages between theoretical postulations and empirical methodologies, thereby contributing to developing more effective agricultural policies and practices.

6. Conclusions

This literature review represents a first attempt to understand what factors may come into play when a farmer decides to increase farm size. This research highlights endogenous and exogenous factors that can influence the decision to invest in land and farm-size growth. The theoretical literature highlights that these factors are not independent but can interact with and influence each other. There is, however, a gap between theoretical and empirical literature concerning both the identification of the relationships between the different factors that can affect the growth of the farm size and the decision to invest in land and the introduction into the adopted models of variables related to the financial position of the farm, but above all connected to European agricultural policies and land regulation. The consolidation of findings from different strands of literature underscores the complexity of integrating diverse factors, from farm-specific characteristics to broader economic policies, in understanding the dynamics of farm growth and land investment.

The decision to consider and analyse both theoretical and empirical literature made it possible to overcome, at least partially, the limitation of the scarce empirical literature conducted over the years penalized by lack of data availability. Although the PRISMA method has proved useful and functional in handling literature from different strands, this type of method and the criteria used do not allow us in the analysis of the results to explore in detail the effect that certain factors might have on farm management. Thus, the PRISMA method may prove to be a useful and functional method for identifying and initially exploring the effects of potential factors on a complex system such as the land market. For future research, a narrative review or an integrative review may prove to be suitable for conducting more detailed analyses of both the direct and indirect effects of various factors, as well as for integrating internal farm dynamics with broader economic and policy contexts, particularly considering the underexplored impact of external environmental variables. Since land prices reflect both current and potential uses [44], it would also be interesting to understand the effect that climate change and environmental policies will have on the dynamics of local land markets. Climate change and related environmental policies can significantly affect land-use decisions, farm sustainability practices, and investment in environmentally friendly technologies. Climate change is expected to affect ecosystems' biological and economic productivity and threaten agriculture's yield and profitability. The impact is not the same in all areas. For some areas, it may represent an opportunity. This may be reflected in land values and generally influence the land market [45–47]. Acknowledging the intricate interplay among various factors and the specific context of empirical research, the results call for a broader framework to assist policymakers, stakeholders, and researchers in formulating strategies that address the complex forces impacting farm expansion and land investments. A holistic approach will enable a better understanding of the agricultural sector's resilience and sustainability in the face of evolving global challenges. A comprehensive framework that integrates farm-level dynamics with broader economic and policy considerations is crucial. This thorough and thoughtful framework should underscore the importance of sustainability, climate resilience, and technological innovation, offering a strategic blueprint for stakeholders.

The land market is thin and local, with geographical features (such as plains, hills, mountains, or closeness to urban centres) playing a role, just as local land regulations can shape and restrict the increase in farm size. Identifying the factors and how they may, directly and indirectly, affect the purchase decision may be helpful for policymakers to understand the dynamics of the land market and implement tools, develop policies, and land regulations in a way that incentivises, supports, and preserves farm growth. EU Member States may be called upon in the short term to do this, given the attention and concern in the European Parliament about the concentration of land in the hands of a few large farms at the expense of small farms. The survival and presence of small and family-run farms are crucial for maintaining the socio-economic infrastructure of rural areas and reducing the abandonment of these areas. Such farms play an essential role in the production of environmental goods and in food production, diversification, and security [5,48].

To understand what is happening within European agricultural areas and the effect of potential internal and external factors, it is necessary to develop a better structured data infrastructure, allowing the recording of farm changes over a long period. This can be carried out both at the individual Member State level and at the European level. The Member States could have various internal bodies and IT systems that record farm and land transaction/acquisition data and communicate with each other. Subsequently, these collected data could be connected to the FADN (future FSDN) data system, which currently lacks comprehensive, up-to-date, and transparent data [5].

Understanding what is really happening in each Member State and within the land markets is necessary to enable each Member State to change its land regulation and implement policies that directly or indirectly influence the decision to invest in land. Given the complex landscape of land investments in the old EU Member States, our policy recommendations emphasise the need for targeted support mechanisms. These should facilitate farmers' access to finance, ensure regulatory clarity and promote the adoption of sustainable and technologically advanced farming practices. Targeted policy development in these areas will provide a sound basis for informed decision making on land investments, contributing to the overall growth and sustainability of the sector.

Environmental policies can influence farmers' farming behaviour and, at the same time, create new opportunities and sources of income. An example would be carbon farming practices that increasingly influence farmland markets and investment decisions. Farmers can access new revenue streams through carbon credits by integrating carbon sequestration into land management strategies. This affects the value of farmland, as lands with higher carbon sequestration potential may become more desirable. It also guides investment decisions toward practices and technologies that enhance carbon storage. As policies and market mechanisms for carbon credits evolve, they will likely play a significant role in shaping the agricultural landscape, driving a shift towards more sustainable farming practices. Like carbon farming, renewable energy production from plants such as agro-photovoltaics, biogas, or wind power can represent new investment opportunities with risks unrelated to agricultural production. However, such initiatives can also attract the interest of non-agricultural actors in the land market. Such actors are often endowed with more financial capital than the farmer, thus leading to an increase in the price of land and distortion within the land market. Access to credit and financial services, coupled with investor sentiment and speculation, maintains a pivotal role in agricultural land markets. The ease of obtaining agricultural credit and favourable financial conditions empower farmers to invest in land and expand operations. Concurrently, investor expectations and market speculation can significantly influence land prices, often decoupled from the farm's current income potential. These dual dynamics underscore the multifaceted nature of factors driving land investment decisions and valuations in the agricultural sector. The land's 'safe haven' nature and the significant increase in land prices require agricultural holding to integrate asset management functions into traditional farm management activities.

The capital gain on land value is a critical element of investment decisions, including those in the agricultural sector. Theoretical models that suggest the direct capitalization of subsidies into land values inherently imply that subsidies could increase the land's market value, thereby offering potential capital gains to investors or landowners. These gains become a significant factor when individuals or entities decide to buy, hold, or sell land, as the expectation of increased land value over time can offer a return on investment beyond the income generated from agricultural production alone.

These factors highlight the dynamic nature of agricultural land markets and the need for multifaceted research approaches to understand and address the challenges and opportunities within the agricultural sector.

Recognizing the diverse factors at play allows stakeholders to craft strategies that support sustainable and resilient farming systems, ensuring agriculture thrives amidst global changes.

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